REMARKS

The Examiner's Action

The Examiner has rejected the application for minor problems with regard to indefiniteness (which indications are gratefully acknowledged and the problems corrected) and for being anticipated or failing to define a non-obvious subject matter in view of the teachings of cited references. The Examiner will appreciate that the claims have been amended to better distinguish the subject invention from the teachings of the references.

The Subject Invention

The subject invention is directed to an improved augmented-reality display system which can locate a reference tool in a wide variety of positions. More particularly, and with reference to FIG. 7, the invention intends that a user's viewpoint is spaced by a first dimension (view distance d) from a viewing plane comprising the synthetic image of both the reference tool, and the associated display intended to be combined therewith, and a second distance (object distance z) comprising the spacing between the viewing plane and the reference tool. In other words, it is envisioned that the augmented-reality display system will comprise a synthetic image at a projected point within the view plane different from the distance defined between the reference tool and a user's viewpoint. This is extremely useful in a situation where the reference item is a piece of paper, such as may be held in a hand as opposed to be only disposed on a desk top, and where the augmented-reality display is implemented through a headset or viewing glasses as disclosed in detail in the specification. It is important for the Examiner to bear in mind that in such an implementation, the viewpoint is not fixed, but will usually move in accordance with head movement of the user. In point of fact, it is intended that the viewpoint will shift as the user changes the viewpoint as a matter of comfort or work need. In addition, the reference item at the "object point" of FIG. 7, also is intended to be movable within a variable viewing area of the augmented-reality display system. Such movement again is to better accommodate the comfort and needs of the user working with three-dimensional moveable objects within the variable viewing area. The ability to

accommodate the freedom of movement of the viewing point and the referenced objects is an important operational advantage of the subject system over the cited references.

The Cited References

The Examiner's principal reference to Robinson is known to applicant/ inventor from his own Information Disclosure Statement. The "DigitalDesk" disclosed in this reference and illustrated in FIG. 3 thereof shows a fixed table for accommodating a relatively fixed piece of paper thereon. As shown in FIG. 1, the desk surface is fixed in position relative to the camera and the projector. Given that this relative fixing provides no variation or relative freedom of movement of the distance between the camera/projector and the desk surface, there is no need for the unprojection step 82 of the present invention (FIG. 6). Similarly, the reference to Kuzunuki et al. relied upon by the Examiner as a teaching reference in support of the §103 rejections accommodates relatively fixed desk display surface. Although the physical objects on the desk surface may be moved by an operator on the desk, nevertheless their distance positioning relative to the camera will not change. There is no need for their identification and distinguishment within a variable viewing area from other objects not comprising the intended reference tool.

The Claims Distinguish Over
The Teachings of the References

The Examiner will appreciate that the independent claims have been amended to limit the invention to an application where the reference object is spaced from the view plane so that the object is spaced from the user's viewpoint by a first distance and the view plane is spaced from the user's viewpoint by a second distance. Such limitations better distinguish the subject invention from the teachings of the references where the viewing plane, i.e., the desk display surface, and the location of the reference item are one and the same. Alternatively, it can be appreciated that the cited references were not

operable, nor intended to operate, in a system where the reference object is located other than on the desk display surface.
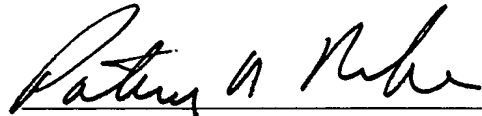
CONCLUSION

In view of the foregoing, it is believed that this application is now in condition for allowance and early notice thereof is respectfully requested.

Respectfully submitted,

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Attachment: Version with Markings to Show Changes Made

VERSION WITH MARKINGS TO SHOW CHANGES MADE

<u>In the Claims</u>:

Claims 1, 5, 8, 13, and 16 has been amended as follows:

1. (Amended) A method of verifying a projected image within a view plane of an augmented-reality display system as a preselected <u>movable</u> object <u>spaced from a user's viewpoint by a first distance,</u> whereby the object may be employed as an interface tool for the system, comprising steps of:

identifying a representative characteristic of the object within the view plane;

determining dimensional aspects of the <u>movable</u> object from the projected image;

computing a corresponding dimensional identity and location of the object at an object point relative to the view plane <u>and wherein the object point is spaced by a second distance from the user's viewpoint</u>; and,

verifying whether the dimensional identity and location are reasonably consistent with predetermined standards for the object.

5. (Amended) The method as defined in claim 1 wherein the [comparing] <u>verifying</u> includes testing from at least one of the tests of (a) whether the object has expected dimensions or proportions, (b) whether the corners are right angles, (c) whether a center point matches when calculated from distinct sets of the corners, (d) whether the corners are generally within a common plane, and (e) whether the object lies within an expected viewing range.

8. (Amended) A method for identifying a <u>movable</u> piece of paper in a <u>variable</u> viewing area of an augmented-reality display system comprising steps of:

identifying an object at a viewing plane in the viewing area having a

characteristic representative of the piece of paper;

locating a plurality of corners of the object;

calculating a dimensional representation of the object in the viewing plane from the locations of the corners;

unprojecting the dimensional representation to calculate a plurality of object coordinates representative of a size of the object and a distance of the object from the viewing plane; and,

comparing the object coordinates with predetermined standards indicative of the piece of paper for verifying the object as the piece of paper.

13. (Amended) An augmented-reality display system for verifying a presence of a predetermined and movable reference frame within a system image, comprising:

a real item disposed within a view plane of the system;

a sensing device for identifying from the view plane a characteristic of the real item associated with the predetermined reference frame; and,

a controller for determining dimensions of the real item within the view plane, for computing a corresponding dimensional identity and location of the real item relative to the view plane, and for verifying whether the dimensional identity and location correspond with the presence of the predetermined reference frame.

16. (Amended) The system as defined in claim 14 wherein the controller includes means for [The method as defined in claim 1 wherein the comparing includes] testing from at least one of the tests of (a) whether the object has expected dimensions or proportions, (b) whether the corners are right angles, (c) whether a center point matches when calculated from distinct sets of the corners, (d) whether the corners are generally within a common plane, and (e) whether the object lies within an expected viewing range.

New Claim 17 has been added.